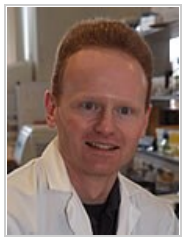
Professor Mark Viant

Professor of Metabolomics
Director of NERC Biomolecular Analysis Facility - Metabolomics Node
Immediate Past President of the International Metabolomics Society

School of Biosciences (/schools/biosciences/index.aspx)



Contact details

Telephone +44 (0)121 41 42219 (tel:+44 121 41 42219)

Fax +44 (0)121 41 45925

Email m.viant@bham.ac.uk (mailto:m.viant@bham.ac.uk)

School of Biosciences
University of Birmingham
Edgbaston
Birmingham
B15 2TT
UK

About

(/university/colleges/les/research-gallery/mark-viant.aspx) Professor Mark Viant's expertise lies in the field of metabolomics. His research spans from method development in analytical chemistry and bioinformatics through to the application of metabolomics to environmental toxicology.

Qualifications

BSc Chemistry (University of Southampton)

PhD Chemical Physics (University of Southampton)

Biography

On completion of a BSc in Chemistry (1991) and PhD in Chemical Physics (1994), both at the University of Southampton, Viant spent almost a decade in the USA, initially as a Royal Commission for the Exhibition of 1851 Postdoctoral Researcher at the University of California (UC) Berkeley (chemistry) and subsequently as a postdoctoral researcher and then independent faculty member at UC Davis (environmental toxicology). Here, he pioneered the application of metabolomics to environmental health issues in aquatic organisms.

In 2003 he relocated to the University of Birmingham as a NERC Advanced Fellow with the remit to further develop metabolomics in environmental toxicology. With funding from the NERC, BBSRC, MRC, Wellcome Trust, Wolfson Foundation, EU, Environment Agency and several US agencies, Viant has established a large and active research group in environmental metabolomics. In 2008 he was appointed to Reader in Metabolomics, in 2009 became the Director of the NERC Biomolecular Analysis Facility for Metabolomics, and in 2010 secured his current Chair in Metabolomics. He has served as the President of the international Metabolomics Society since 2012. His achievements in metabolomics research have recently been recognised by the University of Birmingham's highest award, the Joseph Chamberlain Award for Academic Advancement (2013).

Teaching

I teach metabolomics on a range of undergraduate and postgraduate course.

Postgraduate supervision

For a list of possible PhD projects offered by Professor Viant **www.findaphd.com/search/customlink.asp?inst=birm-Biol&supersurname=Viant (http://www.findaphd.com/search/customlink.asp?inst=birm-Biol&supersurname=Viant)**

Doctoral research

PhD title PhD in Chemical Physics

Research

Research Theme within School of Biosciences: **BioSystems and Environmental Change (BEC) (/research/activity/biosystems-environmental-change/index.aspx)**

Lab website address

http://www.biosciences-labs.bham.ac.uk/viant/ (http://www.biosciences-labs.bham.ac.uk/viant/)

Metabolomics method development; environmental toxicology.

Metabolomics method development

The metabolome is now accepted as an important molecular description of phenotype, and thus its accurate characterisation has become of vital importance throughout biology. One of my group's research goals is to develop tools based around high resolution mass spectrometry and NMR spectroscopy for identifying and quantifying the metabolite profiles of tissues and biofluids. We have developed methods in 2-dimensional NMR, confirmed the high reproducibility of NMR metabolomics in an international intercomparison study, and developed new software tools for data mining *J*-resolved NMR spectra. Also, we have and continue to develop metabolomic methods in high resolution direct infusion mass spectrometry and LC-MS, including tools for metabolite identification and optimal signal processing and analysis pipelines (primarily with Dr Warwick Dunn).

Environmental toxicology

My group focuses primarily on using metabolomics to characterise the molecular responses of aquatic animals, in particular invertebrates, to environmental pollutants. We are not only interested in the molecular mechanisms, but also to investigate the utility of metabolomics and targeted metabolite analyses as diagnostic tools for both environmental monitoring and chemical risk assessment. We have used metabolomics to probe toxicant induced metabolic changes in a range of organisms, in particular marine mussels, water fleas (*Daphnia magna*) and several fish species.

Most notably, our research has led to the discovery of biomarkers of toxic stress that are predictive of whole organism physiological perturbation. This work has received "Honorable Mention" from the Society of Toxicology as one of the top 5 papers published in *Toxicological Sciences* in 2010.

Currently, two areas of research that are expanding within my group include the study into the potential toxicities of engineered nanomaterials (primarily with Professor Kevin Chipman) and the application of metabolomics to increase our understanding of the molecular machinary within *Daphnia magna* and its response to environmental stress (primarily with Professor John Colbourne). Overall we seek to gain an improved mechanistic understanding of the effects of environmental insults on organisms, and ultimately to develop tools to monitor the health of our environment.

Mark Viant describes, in 60 seconds, his research in the area of measuring environmental stress by studying animals at the molecular level

Human disease

Systems Science for Health (http://www.ssfh.bham.ac.uk/) (SSfH) is a University initiative that is applying the latest omics technologies as well as mathematical and computational approaches to the study of human disease. The ultimate aims are to improve patient treatment and long term health. My laboratory is helping to underpin the metabolomics components of this research programme (in collaboration with Dr Warwick Dunn).

Professors Mark Viant, Chris Bunce and Mark Drayson discuss their work into the Systems Science for Health initiative at The University of Birmingham.

Other activities

President of the international Metabolomics Society (2012-present).

Editorial Board of Nature Publishing Group's journal *Scientific Data* (2013-present).

Editorial Board of the journal *Metabolomics* (2004-present).

Publications

L. Mirbahai, A. D. Southam, U. Sommer, T. D. Williams, J. P. Bignell, **M. R. Viant**, J. K. Chipman, Disruption of DNA methylation via S-adenosylhomocysteine is a key process in high incidence liver carcinogenesis in fish. *J. Proteome Research* **12**, 2895-2904 (2013).

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W. B. Dunn, A. Erban, R. J. M. Weber, D. J. Creek, M. Brown, R. Breitling, T. Hankemeier, R. Goodacre, S. Neumann, J. Kopka, **M. R. Viant**, Mass appeal: metabolite identification in mass spectrometry-focused untargeted metabolomics. *Metabolomics* **9**, S44-66 (2013).

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I. Römer, T. A. White, M. Baalousha, J. K. Chipman, **M. R. Viant**, J. R. Lead, Aggregation and dispersion of silver nanoparticles in exposure media for aquatic toxicity tests. *J. Chromatogr. A* **1218**, 4226-4233 (2011).

R. J. M. Weber, A. D. Southam, U. Sommer, **M. R. Viant**, Characterization of isotopic abundance measurements in high resolution FT-ICR and Orbitrap mass spectra for improved confidence of metabolite identification. *Anal. Chem.* **83**, 3737-3743 (2011).

A. D. Southam, A. Lange, A. Hines, E. M. Hill, Y. Katsu, T. Iguchi, C. R. Tyler, **M. R. Viant**, Metabolomics reveals target and off-target toxicities of a model organophosphate pesticide to roach (*Rutilus rutilus*): Implications for biomonitoring. *Environ. Sci. Technol.* **45**, 3759-3767 (2011).

H. C. Poynton, N. S. Taylor, J. Hicks, K. Colson, S. Chan, C. Clark, L. Scanlan, A. V. Loguinov, C. Vulpe, **M. R. Viant**, Metabolomics of Microliter Hemolymph Samples Enables an Improved Understanding of the Combined Metabolic and Transcriptional Responses of *Daphnia magna*. *Environ. Sci. Technol.* **45**, 3710-3717 (2011).

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A. Hines, F. J. Staff, J. Widdows, R. Compton, F. Falciani, **M. R. Viant**, Discovery and validation of metabolic signatures for predicting whole organism toxicology. *Toxicol. Sci.* **115**, 369-378 (2010) – selected as **Highlight Article** for this Issue.

E. M. Santos, J. S. Ball, T. D. Williams, H. Wu, F. Ortega, R. van Aerle, I. Katsiadaki, F. Falciani, **M. R. Viant**, J. K. Chipman, C. R. Tyler, Identifying health impacts of exposure to copper using transcriptomics and metabolomics in a fish model. *Environ. Sci. Technol.* **44**, 820-826 (2010).

C. Ludwig, **M. R. Viant**, Two-dimensional *J*-resolved NMR spectroscopy: Review of a key methodology in the metabolomics toolbox. *Phytochemical Analysis* **21**, 22-32 (2010).

T. G. Payne, A. D. Southam, T. N. Arvanitis, **M. R. Viant**, A signal filtering method for improved quantification and noise discrimination in Fourier transform ion cyclotron resonance mass spectrometry-based metabolomics data. *J. Amer. Soc. Mass Spectrom.* **20**, 1087-1095 (2009).

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J. G. Bundy, M. P. Davey, **M. R. Viant**, Environmental metabolomics: A critical review and future perspectives. *Metabolomics* **5**, 3-21 (2009).

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A. Hines, G. S. Oladiran, J. P. Bignell, G. D. Stentiford and **M. R. Viant**, Direct Sampling of Organisms from the Field and Knowledge of their Phenotype: Key Recommendations for Environmental Metabolomics. *Env. Sci. Technol.* **41**, 3375-3381 (2007).

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M. R. Viant, Improved Methods for the Acquisition and Interpretation of NMR Metabolomic Data, *Biochem. Biophys. Res. Comm.* **310**, 943-948 (2003).

Expertise

Using molecular techniques (specifically the ‘omics’ technique called metabolomics) to study the responses of animals living in the environment to stress, particularly environmental pollutants.